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ABSTRACT

A selective review of research dealing with emerging organizational electronic communication technologies from the communication, management, and organizational psychology literature was divided into four categories: word processing, electronic mail, computer conferencing, and teleconferencing (audio/video). The analysis was directed specifically at the communicative implications of these technologies. It was found that research on word processing focused not only on the communicative strategies, but also on the political implications of word processing implementation and usage. It was also found that the most common use of electronic mail was as a substitute for the telephone. Research on computer conferencing revealed that an emotional dimension was possible through this form of communication and that it widened the range of communication options. The studies on teleconferencing examined its strengths and weaknesses and reported various experiences with its use. From this analysis it is concluded that future research should examine (1) the specific contingency utilization framework of each electronic technology based on its limitations and communicative outcomes, (2) the integration of white-collar workers into communicative processes formerly associated with blue-collar workers, (3) the redefinition of communicative roles within the organization, and (4) the decision making processes and influence processes as functions of these technologies . Twelve pages of references are appended. (HOD)

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EMERGING ORGANIZATIONAL ELECTRONIC COMMUNICATION TECHNOLOGIES: A SELECTED REVIEW OF THE LITERATURE

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Abstract

The purpose of this study was to provide a selected review of research dealing with emerging organizational electronic communication technologies from the communication, management, and organizational psychology literature. Specifically, the literature pertaining to four of these technologies was reviewed: (a) word processing, (b) electronic mail, (c) computer conferencing, and (d) teleconferencing (audio/video). Among the issues discussed in this analysis are potential impacts of these technologies on organizational communication systems, and their relative strengths and weaknesses as communication vehicles. In addition to describing the various studies individually, the paper makes an attempt to assess them comparatively and offers recommendations for future research in this area.

EMERGING ORGANIZATIONAL ELECTRONIC COMMUNICATION TECHNOLOGIES: A SELECTED REVIEW OF THE LITERATURE

Introduction

A number of relatively recent electronic communication technologies are becoming increasingly pervasive in American corporations, including electronic mail, videotex, interactive computers, video teleconferencing, and word processing. In a survey of Fortune 500 corporations, Hellweg, Freiberg and Smith (1984) found that these technologies were variably utilized depending on the specific technology, were spread throughout organizational levels and departmental sectors, and were perceived as means to increase employee productivity and time management capability as well as organizational information storage, retrieval, and dissemination capability. Specifically, the researchers reported the following utilization percentages of the technologies studied among the corporations studied: (a) word processing, 97%; (b) interactive computers, 94%; (c) electronic mail, 56%; (d) videotex, 26%; and (e) video teleconferencing, 16%.

According to a number of scholars (Danowski, 1983; Forney, 1982; Fowler & Wackerbarth, 1980; Svenning, 1983), these innovations and others like them will lead to a considerable restructuring of communication dynamics

between people within and between organizations. As Fowler and Wackerbarth, for example, pointed out, "Technological advances in communication make it possible to unite individuals and groups in distant locations" (p. 236).

New communication technologies will most certainly have dramatic effects on the operational efficiency of corporations. These technologies will quite possibly alter the nature of organizational tasks and the way in which they are performed. In a review of the literature, Danowski (1983) pointed to the alteration of organizational structure, decision-making processes, authority/control structures, job content, and interpersonal communication structures, among others, as a result of widespread organizational computer adoption. It is probably safe to assume that such alterations may also occur as a result of other similar communication technologies.

Purpose of the Study

The purpose of this study was to provide a selective review of research dealing with emerging organizational electronic communication technologies from the communication, management, and organizational psychology literature. On the basis of the electronic communication technologies most generally described in the literature as increasingly prevalent in organizations and germane to the study of

communication channels within organizations, four technologies were chosen for study: (a) word processing, (b) electronic mail, (c) computer conferencing, and (d) teleconferencing (audio/video). The analysis was directed specifically at the communicative implications of these technologies, separately and comparatively, to assess the pertinent research that has been conducted on them thus far and to project future areas for research inquiries.

Review of the Literature

Word Processing

As a common type of new office technology, researchers have focused primarily on the communicative strategies and political implications of word processing implementation and usage. Johnson and Rice (1983) conducted telephone interviews with nearly 200 organizations and followed up with on-site interviews at 55 of these to ascertain managerial perceptions of word processing usage. Based on their research, the authors concluded that typical productivity concepts of the "industrial office" not be applied to assessment of word processing functioning but rather ones that are more appropriate to information processing work. Specifically, the authors recommended that such activity be measured as four levels of re-invention or adaptiveness--the typing model, the efficiency

model, the supervisory model, and the socio-technical system model, the evolution from the first to the fourth involving a reconceptualization of relationships among worker, task, technology, and the organization.

Through examination of case and survey data from 60 organizations, Browning (1983) conceptualized four levels of re-invention for word processing adoption and the accordant political processes associated with each. As part of this conceptual development, the researcher considered four factors: (a) the relationship of the word processing sub-unit to others in the firm, (b) the "micro-political practices" of the word processing "leaders," (c) resource allocations to the sub-unit involved and the parent firm, and (d) perceived rewards from successful word processing implementation.

On the basis of a survey of 152 local government users of word processing systems, Komsky (1984) found an indirect, interactive role for communication process in the implementation of word processing. Specifically, the researcher concluded that (a) decentralization and communication climate generated an organizational climate particularly conducive to implementation success when both variables were at moderate levels, (b) moderate to large amounts of task routineness facilitated the role of communication openness in determining implementation

success, and (c) communication offered a negligible relationship with technology determinants in word processing implementation success.

Electronic Mail

"Convergent" technologies are defined as technological systems that utilize both the capabilities of the computer to process information, and telecommunication systems to transmit information (Steinfield, 1984). One of the more widely accepted "convergent" technologies involves the use of computer and telecommunication systems for the purpose of facilitating human interaction. Most commonly known as electronic mail, these systems generally allow someone to type some form of message using a microcomputer or terminal, and send it to another computer that routes the message to the appropriate recipient or recipients. These messages remain stored in an "electronic mailbox" until the recipient is ready to display them on his/her terminal (Steinfield, 1984).

To better understand the uses of electronic mail, Steinfield (1984) conducted a series of interviews and observations in a large organization with over 2,000 users of an electronic mail system. The degree to which people used the system for each purpose was assessed in a survey of 220 users. Respondents most frequently used electronic mail for task-oriented, information exchange purposes.

Distributing or providing information (i.e., sending announcements), answering people's requests for information and seeking task information from acquaintances (i.e., giving and receiving feedback on reports and ideas), and telling people where to access large files are somewhat frequent information exchange-oriented uses.

The most common application of the use of electronic mail is to substitute for the telephone. Substitution not only avoids wasting time, but allows documentation of the communication activity for future reference. Electronic mail also has socio-emotional applications, as respondents reported using electronic mail for several non-task related activities such as sending messages about interesting events or bits of information.

In an additional study, Steinfield (1985) attempted to identify both task-related and socio-emotional uses of electronic mail in an organization employing this technology. Results again indicated the most frequent applications were task-related information exchange uses, paralleling other electronic mail research (Rice & Case, 1983). Distributing information, seeking information, and giving and receiving feedback on reports or ideas were among the highest in frequency.

As expected, a number of socio-emotional uses identified through interviews and observations proved to be fairly regular applications. Learning about interesting

things or events, and keeping track of company happenings were among the highest in reported frequency.

In addition, the electronic mail system enabled certain forms of interaction to take place that might not be possible, or at least practical, via other media. For example, respondents used distribution lists to broadcast requests for information to all other employees on the system.

Finally, results indicated that electronic mail was not perceived to be an appropriate medium for confidential or private communications. The majority of respondents reported never using the system for discussing confidential matters. Negotiating, resolving conflicts, and getting to know someone are also uses that have been labeled as potentially inappropriate applications for electronic mail (Hiemstra, 1982; Rice & Case, 1983).

Steinfield (1985) investigated 2000 employees in six U.S. cities and London who had electronic mailboxes. Users were primarily white collar professionals, although a number of clerical workers were on the system. Results indicated that increased task-related use was associated with a well-developed electronic mail infrastructure, a positive orientation to electronic mail, including access to relevent others via electronic mail and access to terminals, and a specified need for cross-locational communication. Social use was greater among users with

low tenure, reflecting a possible integration function of electronic mail. The perceived personalness or social presence of electronic mail also reflected social use.

In 1982, the British Columbia Telephone Company introduced a Private Enhanced Message System (PEMS) on a trial basis in their Corporate Development Department (Francas & Larimer, 1984). The study was commissioned to provide an assessment of the impact of PEMS on the department. Through questionnaires and communication diaries, it was immediately apparent that electronic messaging was being utilized for departmental communications, leading to a reduction in the use of informal discussion and the telephone. There was an increase in effectiveness and efficiency overall of organizational communication, a decrease in the overall failure rate of departmental communication, and a somewhat negative impact on interpersonal relations. However, the amount of "upward" communication in the Corporate Development Department increased substantially, to the point where it became the dominant type of communication in the department. Correspondingly, the proportion of "horizontal" and "downward" communications decreased. This result is in accordance with other recent findings regarding the effects of electronic messaging on communication patterns (e.g., Conrath & Thachenkary, 1982) and is often described as "opening up the communication channels to the top" (Francas

& Larimer, 1984). The change in communication patterns was most evident for secretaries.

In order to better understand the social impact of Computer-Based Messaging Systems (CBMS), Rice and Case (1983) conducted a study of recently-implemented CBMS at a large private university. Questionnaires and interviews were administered to high-level administrative users at two time periods, and to experienced CBMS users who were computer services personnel. Results from this study generally replicated previous research on the subject, such as finding overall satisfaction with the system, positive but not extreme benefits, early stability and decline in system usage, general agreement concerning tasks for which CBMS use is appropriate, and an increase in users' communication networks. More experienced users reported higher usage levels, but not much different from the highest managerial users. Both results indicated that "some people can become 'experienced' users of a computer-based communication system in a matter of months" (p. 149).

Reported benefits were largely positive, leading to decreased material and media usage, increased work quality and quantity, and increased benefit to cost ratio and addiction to the system. These results are also general replications of much prior research.

The researchers also concluded that personality traits,

job position, and media styles that affect use of such technologies will be a major factor in the acceptance and consequences of these computer-mediated communication systems.

Gutek, Bikson, and Mankin (1984) examined 530 workers in 55 offices in 26 different private-sector organizations that all had implemented interactive computer technology at least six months prior to data collection. Results suggested that the use of advanced office technology had contributed to workers' perceptions of higher productivity in offices. Production standards were generally higher with no appreciable increase in workers' levels of stress or increase in the number of employees.

A few studies have attempted to determine the general variables that change as a function of moving from non-mediated to mediated communication and which affect participants' communicative satisfaction. Perceived bandwidth, perceived complexity of information, perceived proximity, and perceived feedback have been suggested to be such variables (Korzenny, 1978; Ryan, 1976). Communication skills and communication rules have also been suggested as important factors contributing to communicative satisfaction in teleconferencing (Korzenny, 1978).

Korzenny (1978) has argued that the person-machine interface in mediated human communication can be better dealt with when a comprehensive theoretical approach is

used than when separate communication devices are tested as they appear on the market. Korzenny proposed a structural-functional theoretical approach to mediated communication in organizations in which perceived propinquity (psychological distance between communicators or the degree of perceived closeness of another person or group of people) is considered to be the essential system trait for the continuation of the human communication system.

In a similar study, Korzenny and Bauer (1981) conducted an experiment to retest Korzenny's "Theory of Electronic Propinquity," and to study the determinants of psychological propinquity and communication satisfaction in organizational settings. The results of the study indicated that only perceived feedback was a significant contributor to psychological propinquity. The importance of perceived feedback also accounted for variations in communication satisfaction. Surprisingly, the level of communication rules during the interaction had a positive impact on communication satisfaction when a negative relationship was expected. The positive findings of this study attest to the importance of feedback in allowing individuals to feel spatially close and in promoting communication satisfaction.

Danowski (1982) examined the perceived impact on 266

users of two forms of computer-mediated communication (CMC), private mail and an electronic newsletter, on other available media in a large statewide extension organization. Measurements were taken in view of three relevant time frames: (a) before the introduction of the two computer-mediated communication forms, (b) during the usage cost period, and (c) after free future usage was made available to users. Frequency of media use and underlying media dimensionality were assessed. The researcher found that (a) CMC technology usage was associated with declines in perceived use of U.S. mail and memos; (b) the allowance for free CMC usage in the future was associationally projected with a further decline in mail use, as well as declines in telephone and group meeting usage; and (c) CMC technology usage was viewed as associated with clarification of four dimensions of communication media--"traditional bureaucratic," "one-to-many," "synchronous dyadic," and "asynchronous dyadic."

Danowski and Edison-Swift (1984) examined private electronic mail messages of 300 users in a state extension organization on a monthly basis over a 12-month period. Midway through the time frame analyzed, an organizational merger was announced to its members; change effects resulting as a function of the merger were noted in the message traffic analysis performed by the researchers.

The amount of communication was found to increase 360% and the number of users increased by 240% around the time of the merger intervention. In addition, at this time, individual networks became less interconnected (more centralized), network reciprocity dipped slightly, and macro-level networks became less structured and more grouped.

Computer Conferencing

Rice (1980) distinguished electronic mail systems and computer conferencing systems on the basis of transmitting information (separate files) and sharing information (multiaccessible database), with the latter involving a collective dialogue and perhaps even an agenda. As computer conferencing would lack audio and video elements beyond system graphics, it could be described as a "meeting place" for print-based discussion (Johnson-Lenz, Johnson-Lenz, & Scher, 1978).

On the basis of content analysis of the transcripts of three computer conferences (about the technology), Phillips (1983) concluded that an emotional dimension is possible through this form of communication.

Rice (1982) conducted an analysis of the "private messaging" behavior of eight formal and two other "user groups" utilizing the Electronic Information Exchange

(EIES) computer-conferencing system. This analysis involved message data of the research groups over a 24-month period. The researcher found that for a group to achieve an information-rich role within the network, it must continue to exchange information in all directions and be perceived by other system groups as an appropriate recipient of "above-average" message levels. Results of the study indicated that status as only a transmitter or only a receiver represents imminent isolation in terms of systemwide information exchanges. In regard to the latter point, the author suggested that a leader might let such isolate or receiver status occur in order to focus communicative exchanges within the group itself.

Hiemstra (1982) analyzed the transcript of a computer conference using the politeness strategy framework. This interpretive approach was useful in addressing the question of whether or not communication that is mediated via information technologies may alter the "culture" of the organization. Culture is defined by Schneider (1976) as a "system of symbols and meaning" which together with norms and rules, make up the social reality of members of a culture.

There were three significant findings in the analysis. First, concern for face (the "positive social value a person effectively claims for himself by the line

others assume he has taken during a particular contract" Goffman, 1967, p. 51) was strongly evident in the language of the conference. Almost every utterance was interpreted to involve a face-threatening act. This finding contradicts the work of Hiltz and Turoff (1978) that stated participants in computer conferences drop the usual maintenance of face.

Second, a pattern of politeness strategies emerged that seemed to indicate a particular ethos for the computer conference. Hiemstra (1982) concluded that it was not lack of concern for face that created the ethos of the conference; rather, it was the choice of politeness strategies that created an ethos that seemed one of relative coolness and distance.

Third, and most striking, the politeness strategy, observed as perhaps the most pervasive in natural conversation, was observed only once in a mixed utterance. This was seen as the most significant way in which the computer conference may alter the intersubjective process of communication.

Johansen and DeGrasse (1979) examined how computer conferencing affected specific aspects of working patterns: with whom people work, when they work, where they work, and how they work. They found that computer conferencing increased the reported frequency of

communication with distantly located researchers and those within other disciplines. Participants in their study changed their assessments of how frequently they communicated with each other. The authors also found a number of instances where computer conferencing added flexibility to where people work; while increased use of computer conferencing could encourage greater cooperation between researchers, it would require a definite change in a researcher's communication habits.

There are also significant psychological drawbacks that must be adapted to. One is driven by active teleconferencing. The authors found that it can be very distracting because one is continually feeling a need to respond to questions by others.

The authors concluded that computer conferencing widens the range of communication options open to participants, and in doing so, reopens previous decisions about the structure of communication activities within an organization.

Teleconferencing

Fowler and Wakerbarth (1980) concluded their literature review with a set of propositions about the relative strengths and weaknesses. Eight audio

conferencing strengths were noted: (a) that simple problem solving is achievable through audio technology; (b) that "information seeking" and "idea discussion" are amenable to this technology; (c) that output quantity or idea quantity differences exist between audio and face-to-face brainstorming sessions; (d) that audio technology is workable for information gathering and psychiatric interviews; (e) that the individual with the strongest case in a negotiation situation is more successful with audio communication media than a face-to-face interaction; (f) that more opinion change is likely through audio media in conflict situations than through face-to-face contact; (g) that communication parties are more attentive to audio media than face-to-face encounters; and (h) that audio teleconferencing is cost-effective.

The researchers pointed to four weaknesses of audio teleconferencing: (a) that it is a poor means to get to know someone; (b) that audio media are perceived as less personal than face-to-face ones; (c) that audio-only interaction may engender more hostility, be less productive, and require more time for group maintenance activity than face-to-face encounters; and (d) that audio media are undesirable for complex tasks.

Fowler and Wakerbarth (1980) noted six strengths of face-to-face conferencing: (a) that this modality is

particularly amenable to interpersonal relations and in conflict situations; (b) that it is preferable for the presentation of statistical information; (c) that time spent on group maintenance functions is lessened with face-to-face contact; (d) that more messages are exchanged through face-to-face interactions; (e) that in-person contact is perceived more favorably than audio-only communication; and (f) that communication interactants are more certain of their perceptions through face-to-face contact (though not necessarily more correct).

Finally, the authors pointed to two weaknesses of face-to-face conferencing: (a) that only about 30% of communication interactions within the organizational context necessitate face-to-face encounters; and (b) that visual distractions may emerge within the face-to-face framework.

One problem that has plagued audio teleconferencing is that of acoustical conditions in conference rooms. Hough (1976) described the Bank of America audio system in San Francisco, which is generally acknowledged as one of the highest quality systems:

> Achieving this system required unusual measures. Most surprising of all are the structural aspects. The room is completely isolated mechanically from the

> rest of the building, despite its being in the middle of the building, on one of the top floors. Moreover, no wall is parallel to any other wall. (Hough, 1976).

Such elaborate designs may be possible for a large organization that can afford to establish permanent conference rooms, but are certainly impractical for those who need the flexibility and economy of portable systems.

Three crucial elements necessary for an effective audio teleconference are brevity, regularity, and simplicity. People generally seem to tire more easily when using visual media, and as a result, meetings are exhausting if they go much beyond an hour (Johansen, Vallee, & Spangler, 1979). Like most other conferencing media, audio requires that all participants be present simultaneously.

The success or failure of technological innovations has often depended upon users' reactions to them. Ryan (1976) investigated users' reactions to teleconferencing, specifically measuring the influence of teleconferencing medium and status on the aestheticism, evaluation, privacy, potency, and activity of the medium. He found that the high channel capacity of face-to-face conferencing was perceived as more aesthetically pleasant and evaluated more positively than the narrow channel of audio teleconferencing. Audio teleconferencing was perceived as

more potent than both face-to-face conferencing and video teleconferencing. Users also saw the face-to-face conferencing as more private than video teleconferencing. Analysis revealed neither an activity of the medium nor status main effect.

In 1976, the UNESCO General Conference decided to take advantage of an offer made by the delegates of France and the Federal Republic of Germany to make use of their experimental satellite "SYMPHONIE" to maintain communication between the two centers and to conduct a major experiment in teleconferencing. The objectives of the experiment were to determine to what extent the use of a communication satellite link would enable delegates to effectively communicate, and to measure the utility of various technical facilities in improving conference services and in facilitating press and broadcasting coverage. Evaluation of the communication facilities indicated that the advantages of the satellite were its capabilities to give and receive information on conference matters and/or on current program activities for decision making, to follow the debates on crucial issues, to foster a sense of participation for those staff members staying in Paris, and to foster personal contact among the staff. The experiment left no doubt that if future General Conferences of UNESCO were held away from the organization's

headquarters, the large scale use of telecommunications (either by satellite or conventional means) would be essential.

Carey (1981) examined teleconferencing from a social interaction perspective. Specifically, he analyzed a series of 30 teleconferences over a seven-month period that were part of a demonstration project conducted by the Alternative Media Center of New York University.

When examining the differences between large and small group interactions via teleconferencing, some interesting findings emerged. In general, the small group teleconferences involved considerably more speaking turns. There were more participant comments and questions in the large group teleconferences during opening and closing periods. However, the pattern was reversed during the actual meeting, when small group participants contributed far more comments. Large group teleconferences were more formal and there was a tendency for participants to act as a single body and avoid private communication between two individuals. It also appeared that small group teleconferences can achieve a greater volume of interaction, and further may encourage a more informal style of interaction.

The research suggested there is a need for certain organizational work in an audio teleconference (e.g., to

maintain continuity in the information flow and to regulate information) which can be accompanied through a strong moderator and written agenda. Finally, the study suggested that audio teleconferencing is a distinct mode of communication with its own properties and associated codes of behavior.

Williams (1978) attempted to examine the effectiveness and acceptability of the telephone and other new teleconference equipment as compared with face-to-face communication. Results indicated that although teleconferencing affected neither the number of ideas nor their quality or originality, teleconferencing did affect the patterns of support within the group.

Similar experiments examining teleconferencing have yielded some general conclusions. First, tasks that are low on interpersonal involvement, and are generally cooperative in nature, are relatively insensitive to the use of audio or video conferencing as a substitute for face-to-face communication. Such tasks include information transmission (Davis, 1971), problem solving (Chapanis, Ochsman, Parrish, & Weeks, 1972), and the generation of ideas (Williams, 1975).

Second, tasks that require more interpersonal involvement are sensitive to the substitution of telecommunication for face-to-face interaction. These tasks

include negotiation (Short, 1974), conflicts of opinion (Short, 1973), and getting to know someone (Williams, 1975). Short (1973) also found that when pairs of people argued over controversial topics, they changed their attitudes more if the conversation had been by telephone than if it had been face-to-face.

Third, the medium of communication has an effect on the structure of the group. Strickland, Guild, Barefoot, and Paterson (1976) found that leaders do not emerge in small group teleconferences in the same way as they do in face-to-face groups. Small groups are also more likely to break up into opposing coalitions due to the separation caused by teleconferencing (Tyler, Cartwright, & Collins, 1976).

Fourth, various aspects of the communication process seem to be affected by the medium used. Rutter and Stephenson (1979) found that interruptions occurred more frequently in face-to-face interaction.

Wilkens and Plenge (1981) examined the extent to which a person speaking could be recognized in a simultaneous picture and sound transmission. The authors concluded that before expensive picture transmission is considered, a successful teleconference required good sound transmission. Good sound transmission is more important for better identification and communication than

expensive picture transmission. The combined use of picture and sound transmission can achieve an improvement in communication. Overall, it may be concluded that if a teleconference is supported by moving pictures with good sound transmission, it is possible to deal with difficult conference subjects (Wilkens, Schwartz, & Tilse, 1979).

Christie and Holloway (1975) designed an experiment to test what communication media managers would choose for their business discussions. Significantly, more subjects chose to telecommunicate: when the discussion was given a non-person-orientation rather than a person-oriented description; when subjects were told the discussion involved acquaintances rather than strangers; and when the travel time associated with holding the discussion by meeting face-to-face was long. The type of telecommunication system did not have a significant effect. It was concluded that technological improvements in telecommunication systems may be less important in determining the impact of communication technology on management styles than other factors unrelated to the technology itself. This study also demonstrated the usefulness of the distinction between person-oriented and non-person-oriented business discussions and of level of acquaintance of participants in business discussions.

Johansen, Hansell, and Green (1981) believed that the

reason teleconferencing has not emerged is because the optimistic growth forecasts were based on a belief that readiness factors would mature rapidly and develop naturally into enabling forces. However, the maturation of readiness factors has been slower than many expectations. Enabling forces have only begun to emerge, some as outgrowths of readiness factors and some as new forces based on the perceived needs of potential users rather than the capabilities of teleconferencing technology.

Chillcoat and DeWine (1984) examined the impact of various types of teleconferencing on receiver perceptions of the leader's credibility, attractiveness, and homophily. Four conditions were introduced as variants of "social presence" of the medium: (a) face-to-face, (b) video and audio on a large monitor, (c) video and audio on a small monitor, and (d) audio only. Participants in the small monitor, audio and video condition evaluated the leader's attraction and homophily more favorably than did those in the audio only group. The authors concluded that the audio-only channels were workable if the situation involved information dissemination or the speaker conveyed negative nonverbal cues.

Svenning (1983) examined individual user responses to video teleconferencing adoption within the corporate context. The subject population for the study emanated

from a large geographically dispersed corporation involving ten semi-autonomous companies operating in various industry areas. A total of 795 individuals participated in the study, representing various job types and hierarchical levels.

The researcher found that employee attitudes toward the adoption of the innovation were associated with the individual's perceptions and expectations of its utility, cost, ability to increase productivity, and the ease by which it could be learned. In addition, perceived needs and current communication requirements were found to influence the employee's willingness to experiment with the new technology.

Ruchinskas (1983) surveyed 800 managers in ten operating companies of a corporation to ascertain their relative perceptions of face-to-face, telephonic, and written communication as well as their projected views toward video conferencing. Reliability was found to be the dominant predictor of utility across the four media forms. In addition, the results revealed that ease of use/convenience were nearly as influential as reliability and that social presence items and comfort were significant but lesser predictors.

Fulk and Dutton (1984) conducted intensive interviews with managers within a large aerospace corporation and a

large public utility to ascertain their perceptions of the functions and effects of video conferencing for business meetings. Their results suggested that teleconferencing (a) is sometimes viewed as a means for travel substitution (leading to reduced participant fatigue and better time management), (b) provides a vehicle for lower-level managers with access to information and decision processes otherwise unavailable to them, and (c) offers efficiency since communication activity is more task-oriented and an agenda is completed more quickly.

Israelski (1979) conducted an evaluation of participant perceptions of a Bell System two-way video and audio teleconferencing system and concluded that it (a) offered a satisfactory travel substitute for 75% of its users, (b) created additional communication opportunities, and (c) acted as a consolidation for inefficient in-person encounters.

Duncanson and Williams (1973) conducted three studies of video conferencing varying technical aspects of the medium to ascertain user reactions in each condition. In the first case, two locations about 35 miles apart were linked through use of the technology in the context of "naturally occurring" conferences. Conventional television cameras and monitors were employed, with voice-activated devices to provide close-up video coverage of a speaker.

In the second study, the researchers employed a laboratory preference test to note user opinions about positioning and viewing parameters of camera and monitoring equipment for video conferencing. Finally, in the third study, subject opinions regarding the acceptability of a reduced bandwidth video conferencing facility were assessed through a simulated conference.

The results of the three studies conducted by Duncanson and Williams (1973) revealed that: (a) participants in the "naturally occurring" conferences condition perceived them very favorably, indicating that they would prefer them over traveling to a meeting 50 miles away for an hour and a half; (b) participants were favorably disposed toward the voice-switched video system so they could obtain close-ups of speakers and an overview of the conference room involved; (c) for the I-MHz bandwidth facility, the acceptability of the field of view declines from highly acceptable with one person in the field to midway between acceptable and unacceptable for three people in the field; and (d) participants in the simulated conferences condition rated their conferences less favorably than did those in the "naturally occurring" conferences condition and as slightly lower in productivity, efficiency, and enjoyability than did those in the simulated face-to-face conferences condition.

In a field experiment in a school system, Fredin (1980) tested the impact of two-way cable television on the generation of diverse ideas in work groups. The researcher found that (a) communication differentiation regulated the amount of diversity of ideas within groups; (b) within the interactive schools, the lower the communication differentiation, the greater the maximum diversity of ideas; and (c) under certain conditions, the interactive cable system suppressed idea diversity.

Discussion

Advances in electronic technology are clearly transforming the work environment. Concordant with technical changes, full implementation of the electronic office will dramatically alter the nature of organizational tasks, time management capability, information storage and retrieval, but probably most of all interpersonal communication networks, through enhancement of communication between distant interactants and realignment of traditional communication modalities.

The research cited in this paper offers insights as to the potential and realized effects of these technologies at the interpersonal, work group, and organizational-wide levels. Employee reactions to adopting these innovations and utilizing them are viewed in terms of available

technical options, but primarily in terms of impact upon organizational functioning and individual satisfaction with them as means to adapt to task demands and work objectives more easily.

The studies reported here are almost exclusively based on data from corporate environments, rather than simulated or laboratory contexts. Sample sizes vary in them considerably from very limited subject populations to ones in excess of a thousand. The types of organizations studied include governmental agencies, educational institutions, public utility entities, and industrial corporations. Both quantitative and qualitative methodologies were employed in these studies through content analyses of messages, intensive interviews with users/potential users, and survey techniques. Network analysis instruments and researcher generated survey instruments have been most frequently incorporated in these studies; few studies have relied upon specific communication research measurement tools.

A variety of suggestions for future research inquiry may be made on the basis of the foregoing analysis, primarily as an extension of what has already been initiated: (a) a continuation of current research on the specific contingency utilization framework of each electronic technology based on its technological limitations and

communicative outcomes; (b) more extensive research on the integration of white-collar workers into communicative processes formerly associated with blue-collar workers (e.g., word processing); (c) more extensive research on the redefinition of communicative roles within the organization as a function of the adoption of these technologies; and (d) more extensive research on decision-making processes and influence processes as a function of these technologies.

Another area of future research concerns technology aversion, the negative feeling some people experience when they use or anticipate using a technology, in connection with the adoption of electronic communication devices in organizations. Very little research has thus far focused on the impacts of such technology aversion (Reinsch, 1984). In contrast, considerable research has been conducted concerning causes and effects of oral communication and writing apprehension. Research should be directed toward identifying the causes and effects of technology aversion to electronic forms of communication which might be adopted in organizations to ascertain whether or not there are parallels among the various types of communication apprehension.

While the electronic office may make corporations process information more quickly, the impact upon employees

in terms of possible reduced face-to-face contact, with greater reliance upon mechanical forms of communication, needs to be continually assessed as these technologies become more pervasive.

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